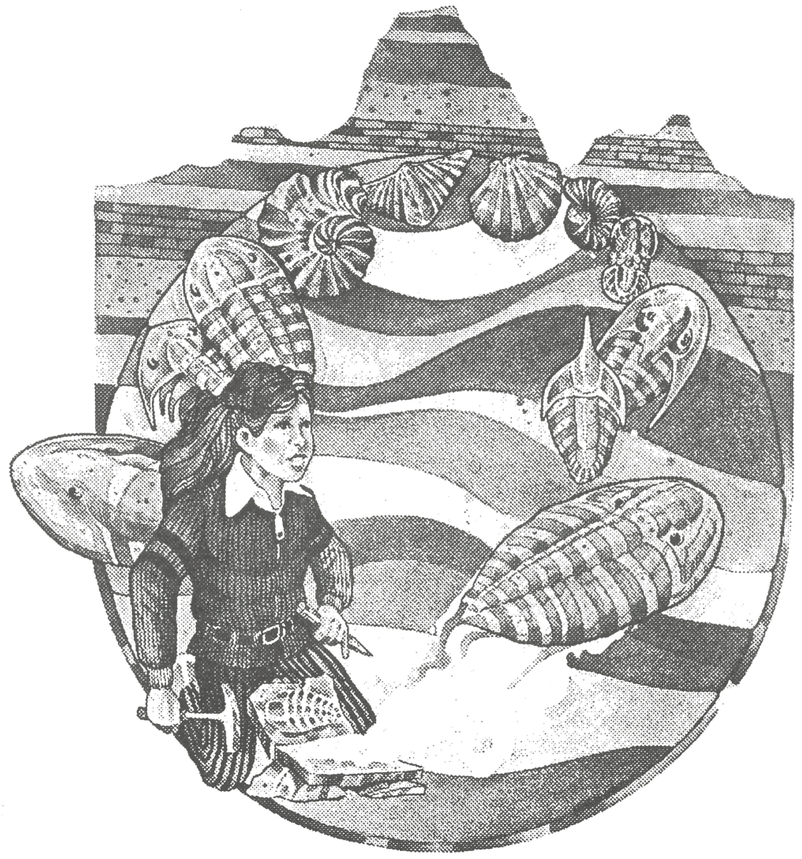
Rock Doctor



Teacher's Handbook

ENTREX

Search & Solve Series

Rock Doctor

Entrex Software Inc.
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Victoria, B.C., CANADA, V8X 5E1

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Printing History: First Edition - October, 1988
Second Edition - March, 1990

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ISBN 1-55047-024-8 (APPLE)
ISBN 1-55047-026-4 (PC)

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I. Using the Simulation

1.1 Introduction

Rock Doctor is a sophisticated simulation which will help students learn about geology; in particular, about rocks and fossils. The program is designed for students in grades 6—9, but is appropriate for people aged 12 and older. The reading level of the background material is rated at grades 7/8. A glossary is provided for younger students.

In the simulation players are sent on a exploration of a mythical land, in search of a legendary "King of Trilobites." The "King" is apparently a 60 cm cast of an ancient trilobite and is made entirely of gold. To find the cast they must be able to identify different rocks and fossils, classifying and dating them appropriately. The geologic clues presented by these rocks and fossils will lead them to the location of the gold fossil.

Players will sift through igneous, metamorphic and sedimentary rocks outcropping in terrains varying from volcanic to tundra, from coastal beaches to towering, young mountains. Possible discoveries range from common fossils to such exotic (and unlikely) finds as woolly mammoths (frozen in ice) and insect fossils (trapped in amber).

Rock Doctor encompasses the following features:

- individually or in a lab setting— extra disks are available at a special, low price, or inquire regarding network and site license versions
- ease of use: commands may be selected from a menu or typed in using a simple verb noun sequence
- background information on different types of rocks, fossils, and other geological data
- special utilities for record keeping and the analysis of student progress
- constant and informative feedback through both text and graphics

Most importantly, the student who uses *Rock Doctor* will gain an appreciation of geology and the thrill of uncovering the past.

1.2 Aims and Objectives

The aim of this program is to provide a positive, successful learning experience which will help students enhance their abilities in identifying different rocks and fossils and improve their knowledge about general geology. Most importantly, it is designed to develop confidence and interest in these skills.

This is achieved in three ways:

- through the simulation of geologic exploration, the student will learn about rocks and fossils and a rock hunter's life

- in reading the handouts and answering test questions, students will learn about the geologic time scale, weathering and erosion, classifying rocks and fossils, and will be able to correlate rocks and fossils to their respective time periods

- in viewing the graphics the student will gain a visual appreciation of different terrains and the rocks and fossils found therein

Students must make informed and thoughtful decisions in order to complete the simulation. They must be able to define and implement a strategy to find and identify the Trilobite King.

Knowledge Objectives

Upon completion of the simulation, the student should be able to:

- distinguish and identify igneous, metamorphic and sedimentary rocks

- describe how each of the rock types are formed and explain the rock cycle

- discuss different land formations and the types of rocks likely to be found therein

- discuss the earth in terms of geologic time, and identify flora and fauna typical to each era

- identify common fossils, and correlate each to a specific geologic era

- discuss the role of weathering and erosion in the formation of rocks

Skill Objectives

The student should also develop these specific skills upon completion of the simulation:

- decision-making skills
  - — searching for alternatives
  - — weighing alternatives
  - — evaluating decisions

- social skills
  - — contributing to group problem-solving
  - — expressing ideas
  - — listening to others
  - — defending a point of view
  - — accepting the opinions of others
  - — reaching consensus
  - — cooperating

- research skills
  - — searching for information
  - — categorizing information
  - — record keeping

- strategy formation and implementation
  - — defining possible strategies
  - — testing strategies
  - — examining alternate strategies
  - — planning a course of action
  - — following a course of action

Decision-making and strategy formation and implementation play major roles throughout the simulation. Social skills are enhanced by group decision-making and strategy planning. Students develop their research skills while seeking solutions in the reference material and in other sources.

1.3 System Requirements

There are three disks in this package, titled: *Rock Master*, *Rock One*, and *Rock Two*. Apple versions will operate on Apple II+, IIe, IIc, and IIgs with 64K or more of RAM and one disk drive.

PC versions of *Rock Doctor* will run on any PC (including IBM PCs and the Tandy 1000) with at least 256K RAM and one drive. The PC must be equipped with a Color Graphics Adapter (CGA) or equivalent.

Note: PC versions of this program will contain only two disks. Rock One *and* Rock Two *have been combined on one disk.*

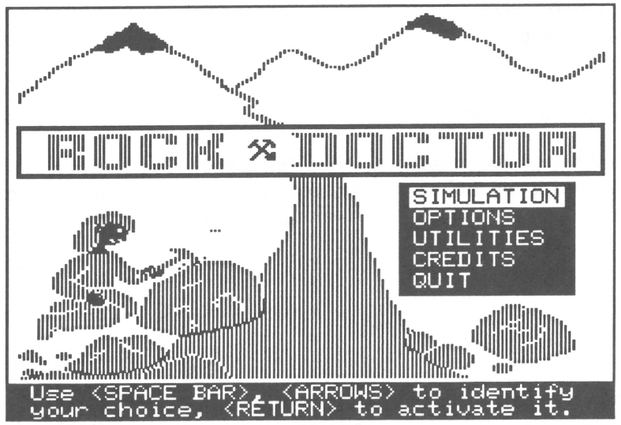
1.4 Loading the Program

Apple The boot (start up) disk is titled *Rock Master*. Place it in Drive One. Boot the program by turning on the computer or by pressing the appropriate keys (as shown in your Apple Owners Manual — i.e. the <CTRL>, <RESET> and <OPEN APPLE> keys in the case of the Apple IIe) if the computer is already on.

PC Boot the program by loading DOS 2.0 (or higher), then insert *Rock Master* and type ***ROCK***

Note: it is preferable to activate any hardware speedup options (i.e. "turbo") before loading the program. Also note, the program may not operate properly if other RAM resident programs are running simultaneously.

Diagram 1 — The Teacher Menu



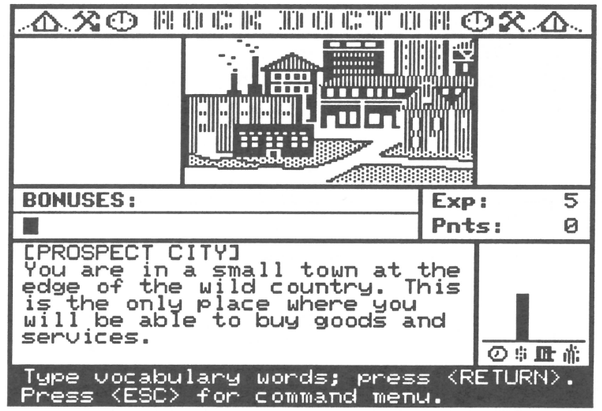
When the simulation is loaded, a Title Screen and Teacher Menu will appear (see Diagram 1). To begin the simulation, press <RETURN>. The computer will instruct you to remove the *Rock Master* disk and insert *Rock One*.

If this is your first time using the program, you will be requested to enter your name. Enter your first and last names. Press <RETURN>. All sessions saved on this disk will now be saved under your name.

The Main Screen should now appear (see Diagram 2). Press <ESC> to activate the Command Menu.

If you have used the program before and have saved your session, the computer will automatically load that saved session (depending on the defaults set under Option Control). If you have not saved a session, you will proceed directly to the simulation.

Diagram 2 — The Main Screen


ROCK DOCTOR
BONUSES:
Exp: 5
Pnts: 0
[PROSPECT CITY]
You are in a small town at the edge of the wild country. This is the only place where you will be able to buy goods and services.
Type vocabulary words; press <RETURN>.
Press <ESC> for command menu.

1.5 Using the Program

While using *Rock Doctor* you will be asked to use menus, respond to instructions, and exchange disks. You will have more success using the program if you have a complete understanding of these three functions.

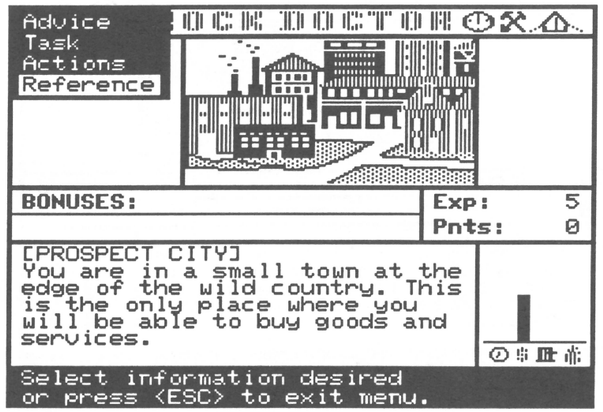
Menus

Throughout the program you will want to take advantage of the Command Menu. This can be accessed from the main screen at any time by pressing the <ESC> key (if the menu is not already activated). The Command Menu is comprised of the *Actions, Info, Report, Quiz,* and *Quit* commands.

To tell the computer what you want to do, use the <SPACE BAR> or <↔> keys to move the highlight to the desired command. For example, to select *Reference* from the *Info* submenu, first select *Info* by moving the highlight to *Info* and pressing <RETURN>. The *Info* submenu will appear in the top left corner of the screen. Now select *Reference*. The menu should appear as in Diagram 3.

If at any time you wish to escape from a menu or operation, press the <ESC> key.

Diagram 3 — Selecting A Command From A Menu


Advice
Task
Actions
Reference
BONUSES:
Exp: 5
Pnts: 0
[PROSPECT CITY]
You are in a small town at the edge of the wild country. This is the only place where you will be able to buy goods and services.
Select information desired or press <ESC> to exit menu.

Instructions

While using *Rock Doctor* you will often see instructions at the bottom of the screen. They will usually inform you of the different command options you have (i.e. "<RETURN> to continue, <ESC> quits") or reasons why the computer does not understand your command. You may be asked to press a key or insert a certain disk. Read these instructions carefully and the program will progress smoothly.

Exchanging Disks

Rock Doctor is on three disks (Apple) or two disks (PC): *Rock Master*, *Rock One* and *Rock Two*. After choosing *Simulation* from the master disk, you will have to exchange *Rock One* for *Rock Master*.

Apple: If you are using a computer with two disk drives, exchange *Rock One* for *Rock Master* in drive one and insert *Rock Two* in drive two. You will not have to exchange disks again unless you wish to use the utilities on *Rock Master*.

If you are using a computer with one disk drive, exchange *Rock One* for *Rock Master* in drive one. You will be prompted when to exchange *Rock One* for *Rock Two*. (This will happen whenever you access any of the text files, *Advice, Reference,* etc., or when you save a session.)

PC: Exchange the two disks when requested. If you have two drives, you may insert *Rock One* in drive two and will not have to exchange disks at all.

This version of the program should not be loaded onto a hard disk. If you require the program to be loaded onto a hard disk, for single or multi-terminal use, please contact Entrex directly.

1.6 Main Screen Components

The main screen (see Diagram 2) is divided into several sections (clockwise from the top left corner): the object display, the terrain display, the possessions display, score and bar graphs, the message display, the text feedback window, and the text input window.

Object Display

Any objects discovered while searching the various areas will be displayed in this area (top left). Included are igneous, metamorphic and sedimentary rocks, casts, molds, and preserved fossils.

Terrain Display

This area of the screen (top centre) will graphically illustrate the type of terrain you are searching. It will change as you move from area to area.

Possessions Display

The *Possessions Display* (top right) will show an icon for each major item you hire or purchase. Items include: truck, boat, mule, helper, expert (assistant), map, tools, arctic equipment, hiking equipment, and dynamite.

Score and Bar Graphs

Score is broken into two categories: experience and points. Experience is gained by identifying objects and correctly answering questions. As your experience increases, you will find objects more easily, and be more likely to receive cash donations. Your score will increase for each object you find and identify.

The *Bar Graphs* reflect the accumulation and/or consumption of time, money, gas and food.

Time — you have a limited amount of time (about two years) to complete your search for the King of Trilobites. The bar will expand as time passes.

Money — there are many items you must pay for in order to properly explore the various areas. You will start with enough money to equip yourself with a basic outfit. Additional money may be raised by requesting donations, or through certain discoveries you may make.

Gas — gas is only needed if you are hiring a truck. If you run out of gas outside of Prospect City you will have to abandon the vehicle.

Food — it is imperative that you eat during your explorations. Food may be purchased at Prospect City. If you run out of food you will not be allowed to search areas; you will, however be allowed to move around until you reach Prospect City.

Message Display

The Message Display bar, at the bottom of the screen, provides information as to what you should do next and will tell you if the computer does not understand a typed in action. If it is not understood, a message will try to indicate why.

There are three common reasons why an action may not be understood. The computer may not understand one or more of the words used, or it may not understand the specific combination of words, or the action may not be possible at that specific time.

The computer may search for a reasonable approximation of your action which it does understand. If one is found, it will ask you if this is the action you intended to take. Answer <Y>es or <N>o.

Text Feedback Window

In the bottom left corner of the screen is the *Text Feedback Window*. Generally, the text will describe the area you are in or characteristics of things you have found. The text may also provide hints as to what action should be taken next.

The text window will sometimes display text which describes events which have happened not as a direct reaction to your actions, but due to some other factor. These events may be either positive or negative. For example, if you have not purchased a map, you are likely to become lost.

Text Input Window

The horizontal strip on the left-hand side of the screen, beneath the object and terrain displays, is called the Text Input Window. This is where you can type in your actions and where actions selected from the actions submenu will appear.

Your typing will begin where the flashing square (the cursor) is located (it will be at the left-hand side when you begin typing in your command).

To enter an action, simply type it in and press <RETURN>. Most actions should consist of no more than a verb and a noun, in that order, i.e. *buy food*. In some cases, an adjective or modifying word will be necessary, as in *move to Grotto*.

If you wish to erase your entry, press the <CTRL> and <E> keys at the same time. If you wish to insert a letter or word where the flashing square is, press the <CTRL> and <I> keys at the same time. If you wish to delete characters beneath the flashing square, press the <DELETE> key.

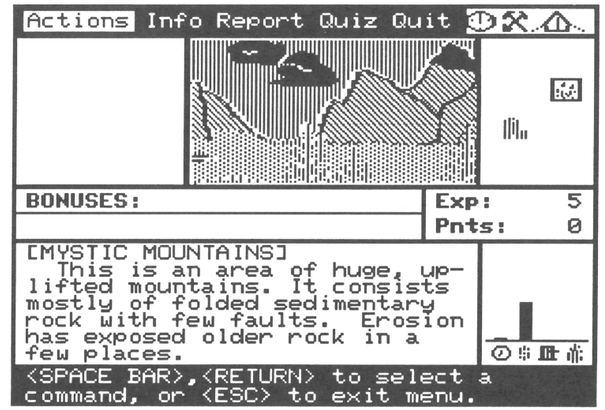
If the number of characters in your action is greater than what can be displayed in the window, the window will automatically scroll to the left to allow you to continue typing. You may also type shortened forms of the longest words. The computer will usually recognize the word from the first four or five characters.

Finally, if you want to repeat the last action you typed in, press the <CTRL> and <R> keys simultaneously. This will display your last action. Press <RETURN> if you wish to repeat that action.

1.7 Commands

When you press <ESC> at the Main Screen, the Command Menu will appear (see Diagram 4). This section provides a detailed explanation of each of the commands available from that menu.

Diagram 4 — The Command Menu


Actions Info Report Quiz Quit
BONUSES:
Exp: 5
Pnts: 0
[MYSTIC MOUNTAINS]
This is an area of huge, uplifted mountains. It consists mostly of folded sedimentary rock with few faults. Erosion has exposed older rock in a few places.
<SPACE BAR>,<RETURN> to select a command, or <ESC> to exit menu.

Actions leads to a list of possible actions; first select the action's verb and then its noun (or complete the phrase). Responses to the action will be depicted graphically and in the text window.

Info leads to a submenu of five items: *Advice, Task, Actions, Reference*, and *Map* (if you have bought one).

- **Advice** provides a few simple strategies for tackling the problem and should be read by those who are uncertain as to how to proceed.
- **Task** provides a detailed explanation of what is involved in trying to become a "Rock Doctor."
- **Actions** lists all the actions possible in this simulation. The actions are divided into groups such as: move actions, buying and hiring, and identification.
- **Reference** presents, in encyclopedia fashion, information about rocks, fossils and other geology related topics. Use the <SPACE BAR> and <↔> keys to select a topic, then press <RETURN>. Press <RETURN> to select another topic or press the <ESC> key to return to the simulation.

Diagram 5 – Reference Topics

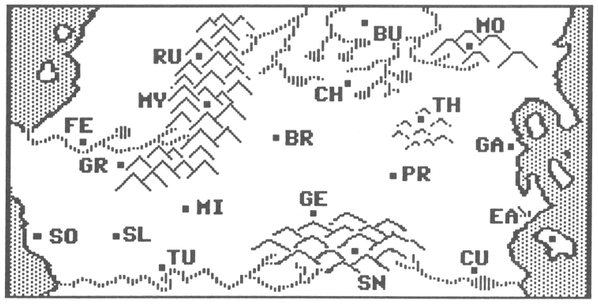
```
REFERENCE MATERIAL

EARLY EARTH              SEDIMENTARY ROCKS
EROSION                  TRILOBITES
FOSSIL FORMATION         WEATHERING
FOSSIL TYPES
GEOLOGIC TIME SCALE
IGNEOUS ROCKS
INDEX FOSSILS
INNER EARTH
METAMORPHIC ROCKS
MINERALS
ROCKS

<ARROWS, SPACE BAR> for other CHOICES
and <RETURN> to read, or <ESC> to exit.
```

Map *shows a map of the whole country. Abbreviations are used as follows:*

Diagram 6 — Map



BR — Broken Arrow
CH — Chartland
CU — Cutthroat Park
EA — Eastern Island
FE — Fernwood
GE — Georgeton
GR — Grotto
MI — Mikkwa
MO — Mount Kyuquot
MY — Mystic Mountains
PR — Prospect City
RU — Rushmore Glacier
SL — Sloat
SN — Snowyvale
SO — Southcliffe
TH — Three Hills
TU — Turbine Canyon

Report Select this command when you are looking for information on your status as a Rock Hound. The first line of the Report indicates your score and your level of skill. From lowest to highest, the levels are: volunteer, student, assistant, professor, expert, and authority. Your level will change as you find and identify new items.

The *Report* option also indicates the amount of money you have, the number of days you have spent exploring and your expertise rating. Beneath these values, *Report* will detail your possessions and indicate your current location.

Diagram 7 — The Report Screen

```
------------------------------<ESC>
          *** REPORT **
 Score: 26              Level: Volunteer
 Money:                  55 rock dollars
 Time:                   84 days
 Expertise:              56
 You have:
  help:                  none
  transport:             truck
  dynamite:    4          boat:   no
  food:       41          tools:  yes
  gas:        21          map:    yes
  Arctic equipment:              no
  Hiking equipment:              yes
 Area: Snowyvale
 OTHER STATISTICS:
  Actions:    32      Commands:     1
  Coffee breaks:          2 hours
```

Under *Other Statistics*, the Report option indicates the number of actions, such as *study rock*, that you have taken. It also indicates the number of commands you have given (this includes such actions as looking up the *Help* option). The time spent on *Coffee Breaks* reflects the amount of time you sit at your computer without entering any actions or commands.

Quiz Choose this option when you wish to take a multiple choice quiz based on the information contained in the program. You may take the quiz as often as you wish to improve your score (depending on how options are set on the Master disk).

The quiz comprises between 1 to 20 questions chosen from a pool of 40 questions (the number of questions is set using the *Set Quiz Values* utility, described in section 3.7).

A good strategy is to use the quiz as a pre-test and a post-test. Take the quiz before using the simulation and reading the reference material and once again when you have finished the simulation. The results should indicate how well you have learned the information in the program.

Quit leads to a submenu of five items: *Save, Restore, Restart, Utilities* and *Quit.*

Save You may save a session if you wish to finish it later. After selecting this option, you will be asked to enter a name to identify the session. (NOTE: If you do not save your session, no record of it will be kept.)

All sessions are saved on *Rock Two* (*Rock One* on PCs). Three sessions may be saved for each user. You may erase any of the sessions and save as often as you like. Each student should have a personal copy of the *Rock One* and *Rock Two* disks. Copies can be made using the copy utility on the master disk (see section 3.2).

Restore Resume a previously saved session with this option. The names of all saved sessions on your disk will be displayed. Type <RETURN> to restore the session highlighted or use the <↔> keys to select a different session. Press <ESC> to return to the main screen without restoring.

When loading the simulation from the Master disk, the computer will automatically load the most recently saved session, if one exists (depending on the setting of certain options). If you do not wish to resume this saved session, choose *Restart* (see below).

Restart This option allows you to start the simulation over. All previous actions and events in the computer's memory will be erased, though sessions saved to disk will not be affected.

Utilities Use this option to go to the Options and Utilities menus on the *Rock Master* disk. Taking this action will end your current session with the simulation. Insert the Master disk and press <RETURN>. Press <ESC> to return to the simulation.

Quit Use this option if you are finished for the day. (NOTE: *Quit* does not automatically save your session.)

1.8 Scoring Points

To score points, you must do two things. First, you must find as many items as you can in each of the various terrains. For each item you find, you will receive points. Extra points can be obtained by correctly answering bonus questions. If you score over 100 points you will be eligible to become a "Rock Doctor" (you still must find the "King of Trilobites").

Second, you must not run out of money. If you have no money you will not be allowed to continue exploring. You can lose your life if you run out of food, become lost in the wilderness or if you are careless in handling your dynamite.

If you score 100 points, you have done very well. If you find the "King" you are truly a Rock Doctor! The maximum score attainable is 250.

II. Using the Program in the Classroom

2.1 Introducing the Program to Students

This program works most effectively when used in conjunction with a complete unit of study focusing on rocks and fossils. It can also be used on its own, as enrichment or supplementary material. It is geared towards science and environment classes in the grades 6 to 9 range. The reading level of the background material is rated at 7/8. A glossary is provided to assist students at lower grade levels.

Whatever strategy you choose, some introductory work will be required to ensure the most effective use of the simulation on the computers.

First, print the *Reference* files using the *Print Files* utility on the *Rock Master* disk. This information will acquaint you (and your students!) with the terms and phrases most commonly used in the simulation. Make copies of the Geologic Time Scale, Common Rocks, Common Fossils, and glossary in section IV of this manual.

Second, initiate a class discussion on geology. What is geology? Why is it important? How does an understanding of the past help us understand the earth today? How does it help us determine what the earth may be like in future centuries? Distribute the handouts. If possible, pass around examples of different rocks and fossils.

Decide which of the two entry formats you want your students to use — either the typed command system or the menu style command selection. Although both formats are available, it is wise to use only one. This will reduce confusion and learning time.

Introduce the aims and objectives of the program. Explain that all actions entered into the computer must follow a strict format. They must contain first a verb, then a noun (as in *buy food*), or may include a modifier before the noun (as in *move to Sloat*).

2.2 Lesson Plans

The following suggested study unit could occupy between three to eight 50 minute classes, depending on the depth of learning desired. Used entirely on its own, the simulation can be completed in one or two classes.

DAY 1: Begin by explaining the difference between minerals, rocks and fossils. If possible, pass around examples of some common minerals and/or rocks which contain those minerals. Explain how rocks are classified as igneous, metamorphic or sedimentary. Show how they differ and what tests are used to demonstrate those differences.
Assignment 1: *Have students collect three or four different rocks on their way home from school and ask them to analyze the rocks in terms of hardness, color, luster, streak, cleavage, etc.*

DAY 2: Examine students' rocks. Check their analyses and correct where necessary. Describe, or show examples of, some common fossils. Explain about casts, molds, petrification, and other means of fossilization.
Assignment 2: *Assign to each student a particular fossil. Ask them to research the fossil, noting its type, approximate age, and the geologic era it belongs to, adding other characteristics of that era to put the fossil in context.*

DAY 3: Introduce the aims and objectives of *Rock Doctor*. Spend about twenty minutes demonstrating what the different commands do and how to enter an action. Make one or two "discoveries" so your students can see how things are found and identified. Explain the *Save, Restore* and *Quit* commands. Ask students to start up *Rock Doctor*, take the *Quiz* and save the results under their name.
Assignment 3: *Hand out four unidentified rocks to each student. Ask them to try to identify the rocks, then support their identifications using the tests mentioned above.*

DAY 4: Continue with *Rock Doctor*. Encourage students to read the *Reference Material* if they are unsure of the correct response to questions (correct responses are worth lots of points — always a good motivator). Ask students to save their sessions before the end of class.
Assignment 4: *Have students write reports on their first days of exploration — what they encountered, what they identified, and what they may have learned.*

DAY 5: Demonstrate some of the simple tools used by geologists. Show how rock hammers can be used to split open rocks to (sometimes) reveal fossils hidden inside. Continue with the simulation, again having students save their sessions before the end of class.
Assignment 5: *Have students research and write a report on the formation of rocks, commenting on the roles of heat and pressure and identifying the rock cycle.*

DAY 6: Ask students to complete their work with the simulation (if they haven't already found the "King"). Scores will vary greatly, based on the student's ability to earn bonus points, and on the number and frequency of incorrect identifications.
Assignment 6: *Have students review their findings and prepare for a multiple choice test on the foregoing material.*

DAY 7: Collect assignments and administer test.

Additional activities could include:

- a field trip to a nearby cliff or rock face to study rock layers, folding, dikes, etc.
- a study of rocks produced from magma, explaining about intrusive and plutonic rocks, and granitic and basaltic classifications.
- a look at the results of weathering and erosion in your area.

Thorough use of *Rock Doctor* can help students gain an excellent understanding of rocks and fossils. It's a fun way to learn!

2.3 Commonly Asked Questions

1. *What is a perfect score? Why is it that, even though I've found the "King," some people have higher scores than I do?*

   A perfect score is 200, but it is possible to answer every question correctly and identify everything you find without reaching 200. However, if you answer all the exam questions correctly before you go exploring, and if you find every object, and get every bonus, and find the "King," your score should be 200.

2. *Now that I'm at the Main Screen, what do I do?*

   It's time to plan your expedition. Before leaving town to explore, purchase tools, maps, equipment and food, and hire helpers and transportation. If you hire a truck, be sure to purchase enough gas!

   Once you are properly equipped, you are ready to explore. Enter the *move to* command, then select one of the locations. Which location you select is unimportant, so long as you try to explore as many locations as possible without travelling further than necessary. On a piece of scratch paper keep track of each location you visit and what you found there.

3. *In some areas I can't seem to find anything at all. Is this because there's nothing to find?*

   Finding things is usually a matter of persistence. In some areas you will have to search many times (and maybe even use dynamite) to find anything important. After a period of time the computer will usually indicate if there is nothing to be found.

   Another reason why you may not find anything is because you have already been to the location you are currently searching, and have found everything there is to be found.

4. *What do I do if my hired truck runs out of gas?*

   Start walking! If you have run out of gas you will have to return to Prospect City to hire another truck. You may still explore without the truck but you will move much more slowly (and are likely to run into all sorts of trouble if you don't have a map and hiking equipment).

5. *Is it possible to find the "King" without finding all the other things hidden at each location?*

   Yes. There is no requirement that you find *everything* before you can find the "King." However, your ability to find it will be greatly affected by both your score and expertise. The higher your score and the higher your expertise, the more likely you are to be successful.

6. *Is there any penalty for incorrectly identifying a group, type or era bonus?*

   There is no penalty in terms of a reduction in score or expertise. However, expertise will increase much more slowly if you answer incorrectly. Even one wrong answer can affect your progress. If you don't know the answer, try to find it in the reference material, or skip the bonus entirely.

7. *Why doesn't the computer understand most of my typed actions? What does it take to get my actions understood?*

The two keys to understanding are syntax and diction. The syntax is simple, just verb, noun, or verb, modifier, noun. All possible actions are listed in the *Actions* file, part of the *Info* submenu. If the computer rejects your action, check that it is on this list.

If your action is on this list, but still doesn't work, there is another possibility. Not all actions are possible all the time. It may be that you are at the wrong location to try that action, or that something else must be done before the action is possible (thus *use dynamite* is impossible if first you do not *buy dynamite*).

8. *What happens if I run out of money or die in the wilderness?*

You have two choices. You may restart the simulation or, if you have previously saved a session, you may restore that session. Either way, you should ask yourself which actions you took, or didn't take, that led to that situation. Try to improve your sequence of actions on your second try.

Do not be disheartened. Geology requires time and patience.

III. Teacher Options and Utilities

3.1 Setting Options on the Master Disk

You may wish to change factors within the program to make it suit the computer hardware you are using or to streamline the "Quiz." This can be achieved by changing one or more of the program Options. To make these changes use the <SPACE BAR> to highlight *Options* at the Teacher Menu. Press <RETURN>. This screen will appear:

Diagram 8 — Options Screen

```
*** CONTROL OF OPTIONAL FEATURES ***

A. Quick Boot:                      on
B. Autorestore Last Session:        on
C. Query on Autorestore:            on

D. Color Monitor:                   off
E. Sound:                           on
F. Quiz:                            on

G. Action Menu:                     on
H. Reference                        on
I. Session Length:                  1

J. Delay Duration Level:            3

 Press a letter to change a setting.
 Press <ESC> to leave as was; or press
 <RETURN> to use the settings shown.
```

If you decide to leave all the options the same, press the <ESC> key. If you want to change an option, type the corresponding letter. For example, to turn *Sound* off, type <E>. Type <E> again to turn *Sound* on.

After you have selected your option settings, press <RETURN> to return to the Teacher Menu.

Here is what happens when each option is turned on.

Quick Boot

This option enables you to save time booting the program. With *Quick Boot* turned on, each time you boot *Rock Master* you will be able to proceed directly to the simulation and bypass the Teacher Menu.

Autorestore Last Session

With this option turned on, the simulation will automatically restore the last session saved, allowing work to continue from that point. Like *Quick Boot* this is especially useful in a lab situation where each student has a copy of the program.

Query on Autorestore

This option allows students to decide, when starting up the simulation, if they wish to continue a previous session or start afresh. The program will proceed to the *Restore* screen and highlight the last session saved. Type <RETURN> to restore the session or <ESC> to start the simulation again.

Color Monitor

If you are using computers with color monitors or are using an Apple II gs, this option should be set to "On." If you are using monochrome monitors, set this option to "Off."

Sound

The program uses sound to indicate when it does not understand a command or action or to signify the occurrence of a special event. In a room with many computers the sound can become annoying. Turn the *Sound* option off to avoid this problem.

Quiz

Included on *Rock Two* are 40 multiple choice questions about rocks, fossils, the rock cycle and geology related to those subjects. These questions may be assigned as a pre-test, a post-test, or both. The Quiz may be taken as many times as allowed by the teacher. Turn this option on if you want your students to take the Quiz, turn it off if you would prefer them to concentrate on the simulation.

Action Menu

Turn this option on if you wish students to have the advantage of choosing their actions from the Action Menu. The Action Menu makes the simulation easier to use, but it also simplifies answering the bonus questions. Using the Menu students may rely less upon their knowledge and research and more on guess work. **Note: answers to exam questions must be typed in!**

If the Action Menu is turned off, students must type in all their actions. This means they will require rudimentary keyboarding skills and must know the syntax and diction understood by the computer.

Reference

A reference section may be used to help students find solutions to bonus questions and prepare for the quiz. You might consider turning this option off if you have printed out the material and given it to the students before they began using the program.

Session Length

Set this option to <1> for a short session, capable of being completed in one or two classes, or set it to <2> for a longer session, requiring two to three classes.

Delay Duration Level

The Delay Duration Level (DDL) adjusts prompt delay/response time. Settings range from 1 to 5, where 1 is very quick and 5 is very slow. People using turbo cards or the Apple IIgs may want to slow the DDL so they don't miss any important prompts. The DDL does not affect basic processing speeds.

3.2 Copy Disks

Before you begin working with the simulation, you'll want to make copies of the student disks (*Rock One* and *Rock Two*). The *Rock Master* disk cannot be copied except for backup purposes. Copies are not needed, since one *Rock Master* can be used to boot the program on every computer in your classroom.

You may make unlimited copies of *Rock One* and *Rock Two*. You may want to make a copy for each of your students.

To copy the student disks, use any standard disk copier, or move the <SPACE BAR> to highlight the *Utilities* option at the Introductory Screen. Press <RETURN>. The following screen will appear:

Diagram 9 — Utilities

```
***              UTILITIES                ***

1. Copy Disks
2. Record Keeping
3. Configure Printer
4. Print Files
5. Modify Questions
6. Set Quiz Controls



NOTE: if the Printer Configuration is not accurate
  then print options may not perform as expected.

Press <1..6> to choose utility.
      <ESC> to exit back to main menu.
```

Choose <1>. The computer will return to the Introductory screen and then ask you to press <RETURN> to load the copy disk utility. Press <ESC> if you have changed your mind or selected the wrong utility.

Single Drive System

If you are using a computer with one disk drive, answer <N>o when the computer asks if you are using a two drive system.

Insert the disk you wish to copy and press <RETURN>. After a few moments the computer will prompt you to insert a blank disk. The computer will display a warning message. Type <N> if you have changed your mind. Otherwise, type <Y> to continue the copy process. You will have to exchange the original disk for the blank disk several times.

When the copy is complete, the computer will instruct you to remove the disk. You may repeat the procedure if you wish to make more copies. Press <ESC> when you are finished. Insert *Rock Master* and press <RETURN> to get back to the Introductory Screen.

Two Drive System

If you are using a computer with two disk drives, answer <Y> to the computer's question "Are you using a two drive system?" The computer will instruct you to insert the "Source" disk (*Rock One* or *Rock Two*) into drive one and the "Destination" disk (a blank disk) into drive two.

Press <RETURN> to copy. When the copy is complete, the computer will instruct you to remove the disk from drive two. You may insert a new blank disk to repeat the process if you wish to make another copy.

When you are finished, press the <ESC> key. Insert *Rock Master* as instructed and press <RETURN> to go back to the Introductory Screen.

3.3 Record Keeping

Record keeping is divided into two sections: individual data and group data. Individual data allows you to evaluate an individual's performance, while group data allows you to compare an individual's performance against members of a larger group.

Individual Data

Choose this option to view data saved on each student disk. The information provided will give a quick insight into the student's progress, including any test scores, and score and level achieved within the simulation.

Press <RETURN> to look at a second data disk. The computer will prompt you to insert the next data disk; then press <RETURN>.

If you wish to compare the scores achieved by different students, type <A> to add the individual data to a group (or class) record. Using the *Group Data* option, you will then be able to compare all students whose data has been saved to the group record. Up to 50 students' data may be saved to the group record (stored on the Master disk).

Diagram 10 — Individual Data

```
***          SESSION & QUIZ RESULTS                ***
Name: JOE TESTER

No quiz results stored.

Last session saved:
Score:                    181/250
Expertise:                117/200
Days gone by:             358
Level:                    PROFESSOR
Commands:  10             Actions:    247
Coffeebreaks:             7 hours

Press  <ESC> for menu.
       <RETURN> to show NEXT individual.
       <A> to ADD individual to group
       <E> to ERASE individual data.
```

NOTE: only the student's scores are saved to the group record, not the student's actions. Transferring the data is NOT the equivalent of maintaining a copy of the individual data.

Press <E> to erase the individual data from the data disk. You will be presented with three options. Press <Q> to erase quiz results only; press <S> to erase saved sessions; or press <A> to erase both quiz results and saved sessions, thus preparing the disk for a new student. If you wish to keep track of the previous student's scores be sure you have added his/her scores to the group record.

Press <ESC> to return to the Introductory Screen.

Group Data

Choose this utility if you wish to view all data saved to the group record (using the *Individual Data* utility). Up to 15 students' records will be displayed on the screen at one time, including their name, their most recent score on the test (if any), their current score in the simulation, and the level they have achieved in the simulation.

Diagram 11 — Group Data

```
***                GROUP RESULTS                ***

Name                      Quiz   Score   Level
----                      ----   -----   -----
JOE TESTER                 N/A     181   PROFESSOR




----------------------------------------
Press <ESC> for menu.
      <E> to ERASE GROUP data.
      <P> to PRINT hardcopy.
```

Type <RETURN> to see more students' records (if you have saved more than 15 to the group record) or to repeat the listing.

Type <E> to erase the group record. Do this only if you want to start a new group record and are sure you have no further use for the current one. It is a good idea to print out the group record before erasing it.

Type <P> to print out the group record. If the printing results are unsatisfactory, try again using the *Configure Printer* option first.

NOTE: when a question mark (?) appears before any Quiz score, the computer has found a score which is based on different option settings than the first test score in the file (see section 2.8 for information on setting quiz options).

Type <ESC> to return to the Introductory screen.

3.4 Configure Printer

Use this utility to configure your printer to this program. This needs to be done only once as all settings are saved. If the printer is improperly configured, some printouts may stretch over page breaks, or may not print out at all. The default settings provided in the program should be adequate for most printers.

Diagram 12 — Configure Printer

```
                PRINTER CONFIGURATION

66     1.  Form length (lines).
80     2.  Form width (characters).

 0     3.  Left margin (characters).
 0     4.  Right margin (characters).
 0     5.  Top margin (lines).
 0     6.  Bottom margin (lines).

 Y     7.  Line feed after C/R.
 Y     8.  Form feeds.
 N     9.  Pause at end of form.
 1     0.  Hardware slot.

  Press 1..6 to select item to configure.
  <RETURN> saves configuration to disk.
  <T> for temporary use of configuration.
  <ESC> to keep the old configuration.
```

Form length: The standard form length for 8.5 x 11 inch paper is 66, or six lines per inch.

Form width: The standard form width for 8.5 x 11 inch paper is 80 characters.

Left margin: Set the number of characters you wish to indent text from the left margin. Default setting is 0.

Right margin: Set the number of characters you wish to indent text from the right margin. Default setting is 0.

Top margin: Set the margin at the top of each page by indicating the number of blank lines you wish to appear before the first line of text. Default setting is 5.

Bottom margin: Set the margin at the bottom of each page by indicating the number of blank lines you wish to appear after the last line of text. Default setting is 5.

Note: the above six settings should not be changed unless there is some specialized custom printing you wish to do — centering, using odd-sized paper, etc.

Line feed after C/R: Check your printer and printer card manuals about this option. Some printers automatically insert a line feed after each carriage return; other printers require the software to instruct it to perform a line feed.

Form feeds: Check your printer and printer card manuals before adjusting this option. Some printers automatically insert a form feed after printing either 54 or 55 lines. If your printer does not automatically insert a form feed, turn this option on.

Pause at end of form: If you are printing onto single sheets of paper, turn this option on.

Hardware slot: (Apple users only) Your printer card must be in slot 1 or slot 2.

3.5 Print Files

Choosing this utility will allow you to print copies of the text files used in the program, including: *Reference, Advice, Task, Actions* and the questions used in the *Quiz*.

To print any of the files, use the <↔> keys to select the appropriate file. Then choose either <1> or <2> for 40 or 80 column print. Press <ESC> to return to the Print Files menu.

If you choose to print the *Reference* files, a list of the topics will be displayed. Type the number of the topic you wish to print, or type <A> to print all the topics. <ESC> will return you to the Print Files menu.

If you choose to print the *Quiz* you will be given five options:

Set Question/Answer Order

This option allows you to change the order of the questions to discourage cheating during the quiz. To change the order, simply type the number of the question you wish to appear first on the quiz. The computer will automatically scramble the following questions in an order predetermined by which question is printed first.

You may also change the order in which the answers appear with the questions. On one version of the quiz you may wish to have the answers appear in the same order as they are stored on disk, i.e. 1,2,3,4. On a second version of the quiz, you may choose to print the answers in a different order, i.e. 2,4,1,3. In this second case, the second answer will be printed first, the fourth will be printed second, etc. All questions will now follow this pattern.

Set Master/Quiz Option: Quiz

This option allows you to decide whether or not to print the questions with the correct answers identified, as for a master, or without the correct answers identified, as for a quiz. You may want to print out several different quizzes, using the *Set Question/Answer Order* option, and then photocopy them.

Set Numbering Option: Print-out

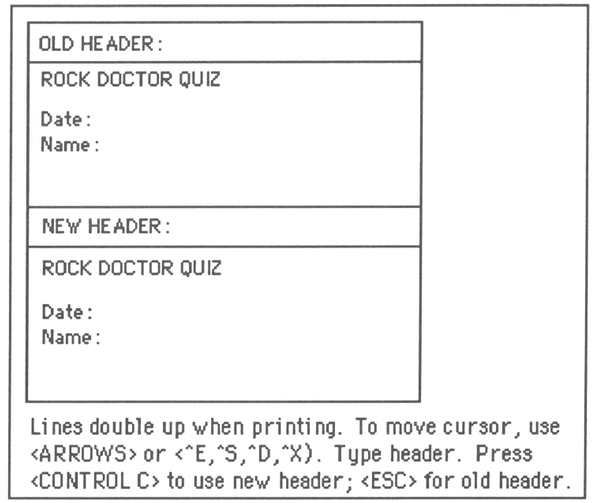
Use this option to adjust the manner in which the questions will be numbered when they are printed. If the option is set to "Print-out," then the questions will be numbered sequentially, i.e. 1,2,3,...

If the option is set to "File" the questions will be numbered according to the sequence they are stored on disk regardless of the order in which they are printed out. This is a useful way of numbering the questions if you will be making up several versions of the same quiz, but will want to refer to questions by their number.

Type Header

This option gives you three lines at the top of the page to write instructions, point values, or anything else you want to appear at the top of the quiz.

Diagram 13 — Typing Headers



The old header will be displayed at the top of the screen. Because the screen's text display is in 40 columns, each of the three lines available for use in the printed header is displayed on screen as two lines. Type in the new header where the flashing cursor is, about half way down the screen. Remember, each line on the screen is only one-half of a line on paper.

NOTE: do not press <RETURN> at the end of each line. Use the <SPACE BAR> to move the cursor to the next line.

Print Questions

Choose this option when you are ready to print out the quiz. The computer will prompt you to insert *Rock Two*. After you have exchanged the disks, press <RETURN> to print (be sure your printer is properly configured!) or <ESC> to avoid printing.

You may halt the printing at any time by pressing the <ESC> key and holding it down until the printer stops. This may take a moment, as the printer will always finish the question it is printing before it responds to your command.

Diagram 14 — Printing Questions

```
PRINTING QUESTIONS

The printing can be interrupted between
each question.  Simply press <ESC> until
the previous menu returns.

Make sure the printer is ready
at the top of a page.

Insert ROCK TWO; press
<RETURN> to print, <ESC> for main menu.
```

3.6 Modify Questions

You may change any of the questions appearing during the simulation. You may also create additional disks with new questions.

Keep in mind that the questions are contained on *Rock Two*. If you change questions on one disk and want all of the students to have them, you will have to make copies of the disk you changed. Instead, you may want to create several different disks and circulate them among the students for an endless array of questions.

NOTE: It is not a good idea to change questions on the original Rock Two. *Only make changes to copies of that disk.*

To edit or replace old questions with new ones, use the <SPACE BAR> to highlight the *Utilities* category at the Introductory Screen and press <RETURN>.

Choose <5> when the Utilities Screen appears. The computer will instruct you to insert *Rock Two* and press <RETURN>. This screen will appear:

Diagram 15 — Modify Questions

```
                * MODIFY QUESTIONS *
#1 of 40

        *-------------------------*
        |  Rocks dating from which |
        |  of the following periods|
        |  would be the oldest?    |
        |   X Jurassic             |
        |   * Cambrian             |
        |   X Quaternary           |
        |   X Devonian             |
        *-------------------------*


 Press <E> to edit,  <N> to see next question,
 <P> to see previous question.  <ESC for main menu.
```

Press <E> if you wish to edit the question. The cursor will appear on the first letter of the question. Use the <↔> keys to move it to the portion of the question you wish to change. Type in the changes over the old information.

If you wish to write a new question, leave the cursor at the beginning of the question and simply type the new question over the old.

When editing and writing questions, keep these points in mind:

- Each question must contain three lines. You cannot reduce the question's length to two or increase it to four.
- Question lines may contain up to 27 characters (including blanks).
- There must be four answer choices to each question, with one choice to a line.
- Only one answer to a question can be correct. Precede the correct answer with an asterisk "*".
- Incorrect answers must be preceded by a capital "X".
- Before typing an answer, skip two spaces, type <*> or <X> for correct or incorrect, and then skip one more space before typing in the answer. You may use up to 23 characters for each answer.

NOTE: If you do not follow the correct procedure for writing questions, the computer will display an error message and will not allow you to save the modified question.

When you have finished editing a question, press the <CONTROL> and <C> keys simultaneously. The computer will ask you if you wish to save the new question. Type <Y> to save the changes or <N> if you have changed your mind.

To move to the next question, type <N>. To move to a previous question, type <P>.

When you have finished editing, press <ESC>. If you are using one drive, reinsert *Rock Master* and press <RETURN> to return to the Introductory Screen.

3.7 Set Quiz Controls

Use this option to set the number of quizzes a student may take, the number of questions to be answered, and the number of points to be awarded or deducted for each question answered correctly, incorrectly, or not answered at all. The contents of each quiz can also be controlled.

Press <1...9> to change the setting of an item, then press <RETURN> to save the new settings. Press <ESC> to restore the original settings.

1. Number of quizzes: may be set from 1 to 10. Each quiz will have different questions, as the questions are chosen randomly from a pool of 40.

2. Number of questions: (per quiz) may be set from 1 to 20.

3. Correct answer: set the points awarded for each correct answer (from 1 to 20).

4. Wrong answer: set the points deducted for each wrong answer (from -10 to 0).

5. Answer avoided: set the points deducted for avoiding a question (from -10 to 0).

6. *Random / seq. questions:* choose whether you wish the questions in the quiz to follow a preset sequence or to appear randomly.

7. *First question* (if sequential): if you have chosen to have the quiz questions appear sequentially, choose which question you wish to appear first, the rest of the questions will follow in sequence.

8. *Successive quizzes to be the same:* if you wish each quiz to be the same, set this option to "yes"; if you wish different questions to appear in the quiz each time it is selected, set this option to "no."

9. *Reference:* this option can be used to restrict access to the reference material; set it to "off" if you wish the quiz to be "closed book" style, or to "on" if you wish the quiz to be "open book."

Geological Time Scale

Era	Period	Biologic Events	Geologic Events	Years Ago*
Cenozoic (Age of Mammals)	Quaternary	first men	ice age	2
		first man-like fossils	Pacific Mtns. rise	10
		Tertiary	Andes, Alps, Himilayas rise	
			Rocky Mtns. rise	65
Mesozoic (Age of Reptiles)	Cretaceous	extinction of dinosaurs	Sierra Nevadas rise	
		first flowering plants		
	Jurassic	first birds		
		first mammals		
	Triassic	first dinosaurs	Appalachian Mtns. rise	225
Paleozoic (Age of Invertebrates)	Permian	extinction of trilobites		
		first reptiles		
	Pennsylvanian	coal-forming plants		
	Mississippian	first large land animals		
	Devonian	first large land plants	Acadian Mtns. rise	
	Silurian	first air-breathing animals		
	Ordovician	first animals with backbones	Taconic Mtns. rise	
	Cambrian	trilobites, etc.		
		first common fossils		600
Proterozoic	Precambrian	rare animal fossils		1,000
		first certain fossils (algae)		2,000
Archeozoic		possible fossils cells		3,000

*Years ago, measured in millions of years.

Common Rocks

Igneous Rocks

Rock	Color	Structure
Basalt	Dark greenish-gray to black.	Dense, microscopic crystals, often form columns.
Gabbro	Greenish-gray to black.	Coarse crystals.
Granite	White to gray, pink to red.	Tightly arranged medium to coarse crystals.
Obsidian	Black, occasionally with brown streaks.	Glassy, no crystals, fractures like a shell.
Pumice	Grayish-white.	Light, frothy, floats on water.
Rhyolite	Gray to pink.	Dense, sometimes contains small crystals.
Scoria	Reddish-brown to black.	Large pores.

Metamorphic Rocks

Gneiss	Gray and pink to red and black.	Medium to coarse crystals.
Marble	Many colors, usually a mixture.	Medium to coarse crystals, is sometimes banded.
Quartzite	White, gray, pink, or buff.	Usually glassy, hard, massive.
Schist	White, gray, red, green, black.	Often sparkles with mica, flaky, finely banded, slippery.
Slate	Black, red, green, purple.	Splits into smooth, thin slabs, dense, fine grains.

Sedimentary Rocks

Coal	Black.	Often shiny, brittle, found in seams or layers.
Conglomerate	Many colors.	Rounded stones and/or pebbles joined by a natural cement.
Flint	Buff to dark gray.	Hard, breaks with a sharp edge.
Limestone	White, gray and buff to black and red.	Forms thick beds, made up mostly of calcium carbonate, fossil rich.
Sandstone	White, gray, yellow, red.	Fine or coarse grains cemented together in beds.
Shale	Yellow, red, gray, green, black.	Dense, fine particles, splits easily, soft.
Siltstone	White, gray, yellow, red	Fine grains cemented together in beds.

Common Plant and Animal Fossils

Animals

Type	Era	Characteristics	Examples
Foraminifera	Paleozoic	one-celled animals, live in shells, index fossils for oil drilling.	Fusilina
Trilobites	Paleozoic	Body is divided into 3 lobes by 2 furrows along the back.	Cerauras Illaneus
Graptolites	Paleozoic	Free-floating, surface dwelling organisms.	Monograptus
Crinoids	Paleozoic	Marine animals with 5-sided body symmetry.	
Tetracorals	Paleozoic	4-fold symmetry, sometimes called "horn" corals.	
Honeycomb Corals	Paleozoic	Reef builders, nests of tube-like structures	Favosites Halysites
Hexacorals	Mesozoic	Modern, forms in cycles and multiples of 6.	Brain Coral
Bryozoa	Paleozoic	Tiny marine animals, hundreds formed colonies.	Hallopora Fenestella
Brachiopods	Paleozoic...	Related to modern shellfish, shell hinged at back.	Lingula
Cephalopods	Paleozoic...	Includes snails, clams, squids; usually hard-shelled.	Ammonites Pearly Nautilus
Fish	Paleozoic...	Breathes using gills, back boned, flexible tail.	Jawless Fish Placoderms
Reptiles	Mesozoic...	Lays eggs, lives in water, on land, cold-blooded.	Brontosaurus Triceratops
Birds	Mesozoic...	Winged, feathered, lays eggs, warm-blooded.	Archaeopteryx
Mammals	Cenozoic...	Warm-blooded, constant body temp.	Woolly Mammoth

Plants

Cordaites	Paleozoic	Fore-runner to modern conifers, but blade-like leaves instead of needles.
Calamites	Paleozoic	Appears like giant horsetails, ribbed stalk broken into sections.
Algae	Archeozoic	one-celled plants, as old as 2,000,000,000 years.

4.2 Glossary

basalt an igneous rock, black in color and very fine grained, formed by the hardening of molten material.

basaltic magma molten material composed mostly of calcium, iron and magnesium, and low in silicon.

cast fossil reproduction of an organism, formed when mineral matter infiltrates a mold of that organism.

chemical weathering weathering which changes the material itself into something different.

cleavage the property of a mineral that causes it to break along definite planes.

coal metamorphosed plant material.

conglomerate a sedimentary rock made up of boulders, pebbles, and sand.

continent a large landmass of mostly granitic rock rising above the ocean floor.

crust the outermost, rocky shell of the earth.

crystal the outward form produced by the atoms of a mineral as they combine in an orderly way to build the mineral.

dinosaur a common name given to two groups of reptiles which were dominant during Mesozoic times.

element any of the fundamental substances which consist of only one kind of atom and that cannot be changed into a simpler substance by ordinary means.

era a major division of geological time.

erosion the removal of weathered debris by natural agencies.

extrusive rock igneous rock formed when molten lava hardens on the earth's surface.

fault a break in the crust, along which there has been relative movement between adjacent blocks.

foliated the layered or banded nature of some metamorphic rocks.

fossil any physical evidence (remains, tracks, etc.) of an animal or plant of past geological ages which has been preserved by natural processes.

fracture the way in which minerals not having cleavage planes break.

gabbro a dark-colored, heavy, basic igneous intrusive rock.

geologic time scale scale of time in which the earth has existed, divided into eras, periods and epochs.

gneiss coarse-grained, roughly banded, metamorphic rock.

granite an igneous intrusive rock composed largely of quartz and feldspar.

hardness a comparative mineral test which utilizes a mineral's resistance to scratching.

igneous (rock) a rock formed from molten material.

index fossil a fossil which is used for dating geologic formations.

intrusive rock rock formed when molten material solidifies beneath the earth's surface.

lava molten material which has erupted on the surface of the earth.

limestone a sedimentary rock consisting mostly of the mineral calcite.

luster the way in which light reflects from the surface of a mineral.

magma molten rock within the earth.

mantle the layer of brittle rock lying between the earth's crust and its core.

marble a metamorphic rock which was originally limestone.

metamorphic rock rock which has been changed into another kind of rock by heat and pressure, or by heat or pressure alone.

mineral a solid substance which occurs naturally in rocks, having a specific chemical composition and a specific arrangement of atoms.

mold the impression left in the surrounding rock by a shell or other organic structure.

obsidian an igneous rock, also know as volcanic glass, which has hardened so quickly no crystals have formed.

outcrop a surface exposure of bedrock.

period a major unit of geologic time, representing a subdivision of an era.

petrification the fossil-forming process which turns an organism into stone.

plutonic rock rock formed when molten material solidifies beneath the earth's surface (see intrusive rock).

pumice a frothy volcanic rock formed, usually, from rhyolitic and andesitic lavas.

quartzite the metamorphosed form of a sandstone.

rhyolite a light-colored, volcanic rock similar to granite.

rock any naturally formed aggregate of mineral material.

rock cycle	a series of changes which happens to rocks, leading from one kind to another over a period of time.
sandstone	a sedimentary rock made essentially from sand-sized particles cemented together by quartz or some other mineral.
sediment	a collection of weathered rock material deposited in a body of water or on land by water or wind.
sedimentary rock	rock formed from sediment particles cemented together, or solid crystals of some mineral that have been dissolved in water.
shale	a very fine-grained sedimentary rock composed largely of clay.
siltstone	sedimentary rock composed largely of silt-sized particles.
slate	a metamorphic rock which was originally shale.
strata	layers or beds of sedimentary rock.
streak	the color of a powdered mineral.
texture	geometrical aspects of the particles within a rock, including size, shape and arrangement.
till	unsorted and unstratified glacial debris.
track	fossilized footprint of an animal.
trilobite	an extinct class of marine arthropods which dominated the early Paleozoic era.
volcanic rock	rock formed at earth's surface by the solidification of lava.
volcano	an opening, or series of openings in the earth's crust through which molten material reaches the earth's surface from below.
weathering	the breaking apart of rocks by physical or chemical means.

Assignment Handouts

1. List the three main types of rocks, giving a brief description of each type.

2. What is a mineral? In your own words, try to define it.

3. How is a rock different from a mineral? How is it different from a fossil?

4. List three sedimentary rocks, detailing their basic components.

5. List three metamorphic rocks which were metamorphosed from sedimentary rocks. Which rocks were they metamorphosed from?

6. List three igneous rocks. What metamorphic rocks can be formed from these rocks? What sedimentary rocks?

7. Define weathering. Detail two different kinds of weathering.

8. Define erosion. How does it differ from weathering? What are the different agents of erosion?

9. What role does erosion play in the formation of sedimentary rocks? Explain the process by which sedimentary rock is formed on lake and ocean floors.

10. What is a fossil? Describe three characteristics of fossils and provide examples of each characteristic.

11. Name and describe at least three different kinds of fossils.

12. What is an index fossil? Why do some fossils make better index fossils than others?

13. What period of time is covered by the geologic time scale. Name each of the major divisions of the time scale and indicate the number of years represented by each division.

14. Match the following items to the appropriate period of time.

Mammals	Jurassic
Trilobites	2,000,000,000 years
Ice Age	Silurian
First birds	Quaternary
Origin of Earth	Paleozoic
First air-breathing animals	Cenozoic
Age of Invertebrates	Cambrian
Oldest known fossil (algae)	600,000,000 years
Uprising of Rocky Mtns.	Tertiary
First common fossils	Precambrian

Rock Doctor
Multiple Choice Test

Read each question carefully and then study each of the possible answers. Circle the letter beside the *best possible* answer.

1. **Which of the following is a common characteristic of many sedimentary rocks?**
   a. formed from the rapid cooling of lava
   b. formed by heat and pressure
   c. formed by the deposit of small particles on lake and ocean floors
   d. formed by the slow cooling of magma beneath the earth's crust

2. **Which of the following is a common characteristic of many metamorphic rocks?**
   a. formed by heat and pressure
   b. formed by the rapid cooling of lava
   c. formed from the deposit of small particles on lake and ocean floors
   d. formed when solid mineral crystals dissolve in water

3. **Which of the following is a common characteristic of many igneous rocks?**
   a. formed when solid mineral crystals dissolve in water
   b. formed from the deposit of small particles on lake and ocean floors
   c. formed from metamorphosed limestone or sandstone
   d. formed by the slow cooling of magma beneath the earth's crust

4. **Which of the following could be agents of erosion?**
   a. glaciers
   b. winds
   c. streams and rivers
   d. all of the above

5. **Which of the following could be agents of physical weathering?**
   a. water
   b. birds
   c. acid rain
   d. all of the above

6. **During the Mesozoic era, what kind of animals dominated the land?**
   a. mammals
   b. reptiles
   c. invertebrates
   d. trilobites

7. **Rocks dated from which of the following periods would be the oldest?**
   a. Permian
   b. Quaternary
   c. Jurassic
   d. Cambrian

8. **The origin of the earth is thought to have taken place during which of the following eras?**
   a. Archeozoic
   b. Cenozoic
   c. Mesozoic
   d. Paleozoic

9. **A layered rock is white in color and is made up of fine grains cemented together. This rock is most likely to be a:**
   a. metamorphic rock
   b. sedimentary rock
   c. plutonic rock
   d. mineral

10. **Common table salt, or sodium chloride (NaCl) , is a good example of a (n):**
    a. igneous rock
    b. fossil
    c. mineral
    d. sedimentary rock

11. **A graptolite, dating from about 500 million years ago, is a good example of a (n):**
    a. igneous rock
    b. metamorphic rock
    c. fossil
    d. mineral

12. **A small imprint of a fern is found on a piece of shiny, black rock which crumbles easily. Using various tests the rock is determined to be from the Mississippian period. The imprint is a:**
    a. cast
    b. mold
    c. igneous intrusive
    d. petrified object

13. **The shiny, black rock mentioned above is most likely:**
    a. slate
    b. gabbro
    c. sandstone
    d. coal

14. **Approximately how old would the fern be?**
    a. 100 million years
    b. 200 million years
    c. 400 million years
    d. 800 million years

15. **A green-colored, fine-grained rock splits easily into thin, smooth slabs. From one of the slabs protrudes the shape of a small animal, about 5 cm long, symmetrical along its longitudinal axis, and with two furrows running down its back. The age of the animal is known to be about 500 million years. Identify the animal.**
    a. an early trilobite
    b. a graptolite
    c. a later form of cordaites
    d. a brachiopod

16. **From which era and period did the animal probably come from?**
    a. cenozoic, tertiary
    b. mesozoic, permian
    c. paleozoic, ordovician
    d. archeozoic, cambrian

17. **What type of rock was the animal found in?**
    a. granite
    b. limestone
    c. obsidian
    d. slate

18. **What type of fossil did you discover?**
    a. a cast
    b. a mold
    c. a petrified object
    d. preserved remains

19. **A large boulder is found alone in the middle of a grassy field near an old river. The boulder is mostly white to gray with tightly packed, medium size crystals. Cemented along one side of the boulder is a grayish rock made up mostly of calcium carbonate. There is no indication of metamorphism in either the boulder or the rock. What type of rock is the large boulder most likely to be?**
    a. flint
    b. granite
    c. pumice
    d. shale

20. **What type of rock is cemented to the side of the large boulder?**
    a. limestone
    b. marble
    c. quartzite
    d. rhyolite

21. **The large boulder and the smaller rock could be classified as what type of rocks?**
    a. metamorphic, sedimentary
    b. metamorphic, plutonic
    c. igneous, sedimentary
    d. igneous, metamorphic

22. **What is the most likely explanation for the boulder standing alone in the field?**
    a. the field was once a mountain range which has eroded away
    b. an early explorer placed the boulder there to mark a trail
    c. a glacier carried the boulder from far away, and dropped it there
    d. the boulder resulted from molten material being shot out of a volcano

23. **The rock cemented to the boulder gives a strong indication that:**
    a. the boulder has been metamorphosed from some other rock
    b. the rock was once at the bottom of a lake or sea
    c. the boulder has been a victim of chemical weathering
    d. the rock is older than the boulder

24. **Fossils of what type of animals are most likely to be found in the rock?**
    a. mammals
    b. amphibians
    c. reptiles
    d. cephalopods

25. **In all probability, which is older, the boulder or the rock?**
    a. the rock
    b. the boulder
    c. both the same age
    d. impossible to tell, given the information provided.

4.5 Test Answers

1. c
2. a
3. d
4. d
5. a
6. b
7. d
8. a
9. b
10. c
11. c
12. b
13. d
14. c
15. a
16. c
17. d
18. a
19. b
20. a
21. c
22. b
23. b
24. d
25. b

Appendix A

Network and 3.5" Disk Versions

Loading *Rock Doctor* onto your Hard Disk

(MSDOS versions only)

Instead of making a backup of the original Entrex 3.5" disk, you may copy the files onto a hard disk. Keep the files together in a separate directory and maintain the original disk in case the hard disk copy is damaged.

There is no copy protection on the disk, so it should be a simple matter of creating a new subdirectory on your hard disk (call it "Rock") then copy the files from the 3.5" disk into the subdirectory.

Multi-Load Feature & Custom Lab Packs

The older 5.25" disk versions were designed to allow teachers to make copies of the student disks, then boot the program on multiple computers using the one master disk supplied. Because all program files now reside on one 3.5" disk, this feature is no longer supported.

If you wish to load the program on more than one computer simultaneously, you may purchase as many extra disks as you require (creating your own custom lab pack). To purchase these disks, please provide proof of purchase of the original program to an Entrex dealer or distributor along with a purchase order specifying the number of extra disks you require. Disk prices will be available at all Entrex dealers and distributors.

Operational Differences

The 3.5" and Network versions of this product differ from earlier versions in several important ways. Please read the following carefully.

License Screen

The first time you load the program, you will have to identify yourself as the original purchaser of the program. Please type in your name or the name of the site (school name) in which the program will be used. You will also have to type in the version number of the program. The version number appears on the disk label.

Each subsequent time you load the program the screen will display a message similar to the following: "For the exclusive use of: (the name you typed in)."

Loading the Program

Follow the instructions detailed in the "Loading the Program" section of the manual. Unlike earlier versions there will be no need to exchange disks. Also, the 3.5" and network versions (MSDOS versions only) will automatically load the simulation, bypassing the Teacher Options menu. If you wish to access that menu, you must select the *Utilities* command from the main command bar.

Note: selecting the *Utilities* command is the ***only*** way to access the Teacher Options menu, and thus the only way to access student record keeping, to change difficulty level, to clear sessions from saved files, etc. (see the section in the manual on Teacher Options & Utilities for more information on this part of the program).

Options & Utilities

The following options and utilities are no longer available:

Quick Boot: no longer applicable (MSDOS versions only).

Copy Disks: no longer applicable. See the copyright and warranty section of this manual for your rights in copying your original Entrex 3.5" disk.

The following option has been added to the network version (MSDOS versions only):

Set Pathname: this allows you to preset where saved sessions will be stored by students. The default pathname is A:\. This means whenever a student saves or restores a session, the program will look for a disk in drive A.

The following option has been changed on the 3.5" and network versions (MSDOS versions only):

Quit: choose this option to return to DOS or to network log on/log off routines (previous versions do not exit to DOS).

Saving Sessions

In 3.5" versions, sessions will be saved to the 3.5" disk, or onto the hard disk if you have copied the program onto a hard disk. No new file will be created.

In Network versions, sessions will be saved to a file in a virtual volume located as per the *Set Pathname* option. The default pathname is A:/. In English, this means that when a student wishes to save a session, the program will look for a DOS formatted disk in Drive A, or in whatever drive (and directory) specified in the Set Pathname option.

If the program cannot find a saved sessions file on the appropriate disk, the following message will be displayed:

```
Unable to find saved sessions file.

Please insert saved sessions disk,
then press <RETURN>.

Press <C> to create a new saved
sessions file.

Press <ESC> to return to program.
```

If the student hasn't saved a session previously, he or she will probably have to create a new saved sessions file. Pressing <C> will create a small file on the disk, then will allow the student to save his or her session.

If the student has previously saved a session, simply insert the disk it was saved onto, then press <RETURN>.

Printed in Canada